

Appl. No. 10/601,135
Amdt. dated February 22, 2005
Reply to Office Action of October 21, 2004

Amendments to the Specification

- 1) Please delete the first page which begins "Patent Application For" in its entirety.

- 2) Please insert the following title at the new first page, line 1:

**METHOD FOR CONTROLLING A UNIT FOR THE TREATMENT
BY PRESSURE SWING ADSORPTION OF AT LEAST ONE
FEED GAS**

- 3) Please insert the following subtitle and text on page 1 below the title referenced above in 2):

CROSS-REFERENCE TO RELATED APPLICATIONS

This application claims the benefit of priority under 35 U.S.C. § 119 (a) and (b) 1 to French Application No. 0207717, filed June 21, 2002, the entire contents of which are incorporated herein by reference.

- 4) Please insert the following subtitle on page 1, below the subtitle referenced above in 3):

BACKGROUND

- 5) Please replace the paragraph at page 3, line 1 through line 19, with the following:

Known from other sources is a second type of control which consists in taking account of the purity of the treated gas in order to correct certain parameters of the PSA unit operating cycle. The PSA unit 1 of Figure 1 for this purpose comprises an apparatus 6 for measuring the hydrogen content of the gas produced by the PSA unit. The measurements from this apparatus are transmitted periodically or continuously to the control unit to control the operation of the PSA unit. In the case, for example, of a produced hydrogen specification of 99.9%, that is to say for a minimum acceptable content of 99.9%, a measurement showing a hydrogen content equal to 99.99% leads to the control unit increasing the phase time, whereas a measurement equal to 99.91% leads to a reduction in this phase time, in order to have a margin of safety. This type of control is commonly known as "purity control monitoring". In some cases, only the purity control monitoring is employed, but controlling the PSU PSA unit is then tricky.

Appl. No. 10/601,135
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6) Please insert the following subtitle before the paragraph beginning at line 29 of page 5:

SUMMARY OF THE INVENTION

7) Please replace the paragraph beginning at page 5, line 29, and ending at page 6, line 9, with the following:

To this end, the subject of the invention is a method for controlling a treatment unit for treating at least one feed gas, which method is of the type in which the treatment unit comprises N adsorption units, N being greater than or equal to 1, operating on a parametrized cycle split uniformly into at most N phase times, and in which use is made of a control unit for controlling the treatment unit, designed to modify at least one parameter of the cycle, particularly on the basis of the measurement of values representing the flow rate and/or the composition of the feed gas entering the treatment unit and/or of the gas produced at the outlet of the said treatment unit, and in which, each time there is a predicted change in the composition of the feed gas that is to be treated, the control unit is sent a pre-established signal representing the said change, and the processing unit processes the said signal to determine the parameters of an exceptional operating cycle of the treatment unit which cycle is suited to the said predicted change.

8) Please replace the paragraph at page 6, line 15 through line 17, with the following:

- the said pre-established signal is representative of the intensity of the predicted change in the composition of the feed gas;

9) Please replace the paragraph at page 6, line 19 through line 22, with the following:

- a reference signal is constantly sent to the control unit, and each time there is a predicted change, the said reference signal is modified to form the pre-established signal;

10) Please replace the paragraph at page 6, line 32 through line 36, with the following:

- the duration of the exceptional cycle is indicated to the control unit by the transmission of an end signal, the said end signal being pre-established on the basis of the predicted change in the composition of the feed gas;

Appt. No. 10/601,135
Amdt. dated February 22, 2005
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- 11) Please replace the paragraph beginning at page 6, line 38, through page 7, line 9, with the following:
 - during each parametrized operating cycle of the treatment unit there are, in succession, a phase of adsorption, at practically a high pressure of the cycle and a phase of regeneration comprising a step of depressurization down to a low pressure of the cycle and a step of repressurization practically up to the said high pressure of the cycle, and the parameters of the exceptional cycle that are determined by the control unit are chosen from the duration of the phase time and the duration of at least one of the steps of the regeneration phase;
- 12) Please replace the paragraph at page 7, line 11 through line 17, with the following:
 - a signal representing the flow rate and/or the density of the feed gas stream is sent regularly to the control unit, and the control unit determines the parameters of the exceptional operating cycle of the treatment unit, then adjusts these parameters on the basis of the signal representing the flow rate and/or the density of the said feed gas stream;
- 13) Please replace the paragraph at page 7, line 19 through line 26, with the following:
 - a signal representing the flow rate and/or the composition of the gaseous stream produced by the treatment unit is sent regularly to the control unit, and the control unit determines the parameters of the exceptional operating cycle of the treatment unit, then adjusts these parameters on the basis of the signal representing the flow rate and/or the composition of the said gaseous stream produced; and
- 14) Please insert the following subtitle after the paragraph beginning on line 31 of page 7:

Brief Description of the Drawings
- 15) Please insert the following subtitle and text before the paragraph beginning at line 14 of page 8:

Description of Preferred Embodiments

App. No. 10/601,135
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The subject of the invention is a method for controlling a treatment unit for treating at least one feed gas, which method is of the type in which the treatment unit comprises N adsorption units, N being greater than or equal to 1, operating on a parametrized cycle split uniformly into at most N phase times, and in which use is made of a control unit for controlling the treatment unit, designed to modify at least one parameter of the cycle, particularly on the basis of the measurement of values representing the flow rate and/or the composition of the feed gas entering the treatment unit and/or of the gas produced at the outlet of said treatment unit, and in which, each time there is a predicted change in the composition of the feed gas that is to be treated, the control unit is sent a pre-established signal representing said change, and the processing unit processes said signal to determine the parameters of an exceptional operating cycle of the treatment unit which cycle is suited to said predicted change.

- 16) Please replace the paragraph at page 8, line 32 through line 33, with the following:
 - an amine scrubbing unit 20, the carbon dioxide-rich residual stream from which it is tapped off; and
- 17) Please replace the paragraph at page 15, line 20 through line 26, with the following:

Another kind of control is permitted by the signals source 50. The latter is designed to supply the controller 38, at a predetermined instant, with pre-established signals independent of the feed stream conveyed at the said instant by the line 28 and of the production stream conveyed at the said instant by the line 32.
- 18) Please replace the paragraph at page 17, line 23 through line 36, with the following:

It makes it perfectly possible to forestall the effects of sudden changes in the status parameters of the PSA unit feed gas, particularly when a regenerated bottle of absorbent adsorbent comes back on line upstream, when a piece of equipment or a unit upstream is bypassed for maintenance or servicing, when a secondary feed gas is added to the main feed gas to periodically increase production, when there is a feed gas change, or when an upstream purification

Appl. No. 10/601,135
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unit in one or more constituents such as a scrubbing unit is shut down; all these modifications correspond to predicted periodic operations for which the resulting exceptional PSA feed gas composition is determined by experience, by calculation or by initial analysis.

19) Please insert the following paragraph at page 19, line 8:

It will be understood that many additional changes in the details, materials, steps and arrangement of parts, which have been herein described in order to explain the nature of the invention, may be made by those skilled in the art within the principle and scope of the invention as expressed in the appended claims. Thus, the present invention is not intended to be limited to the specific embodiments in the examples given above.